Research Article

The Secret Life of Emotions

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ABSTRACT—***The possibility of unconsciously evoked emotions is often denied because awareness of an emotion's cause is considered to be precisely what produces the emotion. However, we argue that because emotional responding is important for successful living, both global and specific emotional responses can be induced without awareness. The present research used quick and superquick subliminal priming techniques, and cognitive, feelings, and behavioral measures, to test this hypothesis. Our results show that both global moods and specific emotions can be evoked without conscious awareness of their cause.***

Can people feel disgusted without consciously picturing the rotten food that caused their disgust? Can they experience fear without being consciously aware of the steep cliff that caused their fear? An intuitive answer to these questions seems to be "no." One might argue that specific emotions cannot be unconsciously elicited because emotions are always *about* something. One is sad *about* the loss of a good friend, angry *with* one's disrespectful boss, and disgusted *at* a bloody war picture. Awareness of the cause of an emotion is often precisely what produces the emotion (Parkinson & Manstead, 1992). Thus, when you are hiking in the forest and suddenly find yourself standing face-to-face with a growling grizzly bear, it seems that you need to be consciously aware of the bear to actually experience fear. You may feel aroused and tense, but for fear to be induced you need to know *why* you feel that way (Barrett, 2005; Clore, 1994; James, 1884; Schachter & Singer, 1962).

Interestingly, however, there is no clear empirical support for the claim that a prerequisite for an emotion is awareness of what caused it. In fact, taking a functional perspective (Cacioppo & Gardner, 1999; Ekman, 1984; Frijda, 1988; Keltner & Gross, 1999; Öhman, 1992; Scherer, 1984)—emphasizing the universal and goal-directed nature of emotion—one could argue that it should be possible for emotions to be *unconsciously* evoked. Given that emotional responses are functional and thus help people maneuver successfully through an ever-changing environment, it makes perfect sense that the emotional system is designed to respond quickly and unconsciously to incoming emotional stimuli. After all, you are likely to live longer if you immediately stop moving at the sight of a growling grizzly bear and do not need full awareness for such a response to be instigated. A classic functional perspective thus suggests that emotions can indeed be elicited without conscious awareness. Although emotion researchers acknowledged this point years ago (Lazarus, 1991; Öhman, 1992; Winkielman & Berridge, 2004; Zajonc, 1980), empirical evidence for the existence of unconsciously elicited emotions is scarce.

An essential element in modern emotion theories is the idea of emotion specificity (Frijda, 1988; Keltner, Ellsworth, & Edwards, 1993; Lazarus, 1991; Scherer, 1984; Zeelenberg & Pieters, 2006). It is the specificity of emotions that distinguishes them from (more global) moods and that allows for the differentiation of emotions that have the same valence, such as anger, fear, and disgust. It might seem that for a specific emotion (rather than a global mood) to be elicited, specific stimulus information needs to be encoded. For example, body-posture cues determine whether an assailant evokes not simply negativity, but anger or fear (Parkinson & Manstead, 1992). Can unconscious processing be sufficiently specific that it might elicit fine-grained emotional responses?

Neuroimaging and physiological studies suggest an affirmative answer to this question. Specific brain-activation patterns are observed when participants are unconsciously exposed to disgusted, fearful, sad, angry, and happy facial expressions (Morris, De Gelder, Weiskrantz, & Dolan, 2001; Philips et al., 2004). On a physiological level, unconscious exposure to happy facial expressions and unconscious exposure to angry facial expressions evoke distinctive electromyographic reactions in emotion-relevant facial muscles (Dimberg, Thunberg, & Elmehed, 2000). This indicates that people tend to mimic unconsciously processed facial emotional expressions. However, this finding cannot be taken to mean that mimickers *experience* the emotion associated with the expression. These studies do strongly suggest that the human brain is capable of discriminating among specific, unconsciously processed emotional stimuli. However, given the special nature of facial emotional ex-

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pressions (see Hariri, Tessitore, Mattay, Fera, & Weinberger, 2002; Kimura, Yoshino, Takahashi, & Nomura, 2004), it is an empirical question whether these findings generalize to other types of emotional stimuli, such as mad, growling dogs or dirty, unflushed toilets. Moreover, there is a crucial difference between discriminating among specific emotional stimuli and being emotionally affected by these stimuli (Lambie & Marcel, 2002). Thus, the empirical question whether unconscious exposure to emotional stimuli elicits the experience of specific emotions and specific emotional behavior still remains.

Even though the question whether it is possible for unconscious processing to result in specific emotional feelings has yet to be answered, global unconscious affective processing is relatively well documented. There is strong support for the notion that people can discriminate between globally positive and negative stimuli that are presented outside conscious awareness (Bargh, Litt, Pratto, & Spielman, 1989; Murphy & Zajonc, 1993; Stapel, Koomen, & Ruys, 2002; Winkielman & Berridge, 2004; Zajonc, 1980). The existence of such quick and unconscious positive-negative processing is typically explained using an evolutionary perspective. Such processing is essential to survival of a species because it helps to differentiate between hospitable (good) and hostile (bad) stimuli. The human brain and body have been shaped by natural selection to perform global affective categorizations quickly and effectively, and to respond accordingly (Hunt & Campbell, 1997).

The question is, however, whether quick and automatic detection that something is positive or negative is enough for adequate response to stimuli and events in the world. Is the knowledge that something is positive or negative enough for the organism to prepare for proper action? We think not. We argue that because specific emotions are essential to effective living, quick, unconscious detection of specific emotional information should be possible. It is important to be able to automatically detect both the valence of a stimulus and its specific meaning in order to respond quickly and properly to it. It is crucial to know that something is "disgusting" and not "scary." Knowing that something is "negative" does not suffice.

The fact that global positive-negative classifications of stimuli occur quickly and unconsciously should not be taken to mean that more specific and fine-grained processing of emotional information cannot occur unconsciously (as some researchers have argued—Bargh, 1997; Barrett, 2005; Zajonc, 1980). Quite the opposite: Emotion induction is likely to occur quickly and unconsciously because that is functional for successful living (see also Ekman, 1984; Izard, 1977; Plutchik, 1994). Even though the processing of stimuli in the environment unfolds from the global to the local level (i.e., microgenesis; see Rosenthal, 2004; Werner, 1956), it may proceed without the need for conscious awareness.

Indeed, there is empirical evidence that both global, valence-based reactions and specific, fine-grained responses may occur without conscious awareness (e.g., Stapel & Koomen, 2005; Stapel et al., 2002). Consistent with the idea that information processing unfolds from the global to the specific are findings that global evaluative reactions to stimuli are typically triggered earlier than specific descriptive reactions. In previous work (Stapel et al., 2002), we showed that *super-quick* subliminal exposure to, for example, a smiling female face resulted in global, valence-based reactions ("happy"), whereas *quick* subliminal exposure resulted in specific, descriptive reactions ("woman"). Studies using words as primes showed a similar pattern of results (e.g., Stapel & Koomen, 2005): Super-quick subliminal exposure to, for example, the word *confident* led to global, valence-based reactions ("positive"), whereas quick subliminal exposure to this word led to specific, descriptive reactions ("confident"). In sum, these studies demonstrate that valence-based reactions generally are initiated before more fine-grained reactions, and that both types of reactions can occur without awareness.

Given that fine-grained processing of emotion cues (is it scary or disgusting?) is likely to take somewhat longer than global, valence-based processing (is it positive or negative?), and given that it is functional for both types of processing to occur unconsciously, we hypothesized that the induction of specific emotions can be quick and unconscious, notwithstanding the even quicker induction of global affect. Consequently, we predicted that when unconscious exposure to an emotion-eliciting stimulus is quick, the stimulus will evoke the corresponding specific emotional experience. We also predicted that when unconscious exposure to an emotion-eliciting stimulus is super-quick, the stimulus will evoke primarily global positive or negative feelings.

To test our model of the unconscious genesis of emotional processing, we conducted two studies in which we subliminally primed people with emotion-eliciting stimuli. We selected black-and-white emotion-eliciting primes from the International Affective Picture System (IAPS) to elicit fear, disgust, or no emotion. Taking a multicomponent perspective on emotion (Frijda, 1988; Scherer, 1984), we then measured participants' moods and emotions with cognitive, feelings, and behavioral measures. We expected that super-quick subliminal priming would induce a global mood (Isen, 1984; Niedenthal & Showers, 1991), whereas quick subliminal priming would also elicit the relevant emotion.

STUDY 1

Method

Participants and Design

Undergraduates ($N = 90$) participated in Study 1 for partial course credit. They were randomly assigned to the conditions of a 2 (prime exposure: quick, super-quick) $\times$ 3 (prime emotion: disgust, fear, no emotion) between-participants design.

Procedure and Measures

Upon arrival, participants were shown into one of eight cubicles and seated in front of a computer. They were then told that they would be involved in a series of unrelated studies.

Priming. First, participants performed a parafoveal vigilance task (Bargh & Pietromonaco, 1982; Stapel et al., 2002) in which emotion-eliciting stimuli were presented outside awareness. Participants were told that very short flashes (actually, the priming stimuli) would appear on the screen at unpredictable places and times and that their task was to decide as quickly and accurately as possible whether each flash appeared on the left or right side of the screen. The experimenter instructed participants to place their index fingers on two keys of the keyboard and to press the left key, labeled "L," if a flash appeared on the left side of the screen and the right key, labeled "R," if a flash appeared on the right side of the screen. A fixation point consisting of one "X" was presented continually in the center of the screen.

Participants were seated so that the distance between their eyes and the computer screen was 80 to 100 cm. This ensured that the priming stimuli were presented outside of participants' perceptual fields. The priming stimuli were black-and-white emotion-eliciting pictures taken from the IAPS. They were selected to elicit fear (e.g., a growling, mad dog), disgust (e.g., a dirty, unflushed toilet), or no emotion (e.g., a horse); the fear and disgust primes were pretested to ensure that each elicited the appropriate emotion and no other emotions when presented supraliminally.

Participants were given 10 practice trials to become familiar with the procedure. The pictures flashed during these trials were of neutral stimuli (e.g., a chair). After answering any questions, the experimenter began the 60 experimental trials, 40 with neutral stimuli and 20 with priming stimuli. The order in which these stimuli were flashed was random. In the quick condition, pictures were flashed for 120 ms. In the super-quick condition, pictures were flashed for 40 ms. Each picture was immediately followed by a 120-ms mask, which was a gray square (consisting of black and white dots) the same size as the primes. Completing the task took approximately 10 min.

Cognitive Measures. After the vigilance task, participants were given a word-completion task consisting of 18 word fragments that could be completed as disgust words, fear words, anger words, general negative words, general positive words, and neutral words (3 per category). For each category of fragments, we counted the number of completed words that were related to the intended category. Feeling a specific emotion should result in an increased tendency to complete word fragments as words related to that emotion (e.g., disgusted participants should be more likely than others to complete fragments as disgust words), whereas experiencing a negative mood should result in completing more fragments as general negative words than as positive or neutral words.

Feelings Measures. Next, participants completed the feelings measures, which consisted of a general mood question and eight specific emotion scales. Participants indicated their mood on a 7-point scale ranging from *negative* (1) to *positive* (7). (Responses were reverse-coded for data analysis.) Then, participants indicated the extent to which they felt fearful, disgusted, satisfied, relieved, proud, angry, shameful, and joyful, using 5-point scales ranging from *absolutely not* (1) to *absolutely yes* (5).

Behavioral Measure. The behavioral measure that followed consisted of the choice to take part in a "strange food test" or in a "scary movie test." We expected that fearful participants would choose the strange-food test to avoid more fear-eliciting materials, whereas disgusted participants would choose the scary-movie test to avoid exposure to food.

Debriefing. Previous subliminal priming studies had shown that the paradigm we employed provides sufficient safeguards to prevent participants from becoming aware of the priming stimuli (see Chartrand & Bargh, 1996; Erdley & D'Agostino, 1988; Stapel et al., 2002). However, to ensure that this was the case, we included an extensive funneled debriefing procedure at the end of the study. During the debriefing, participants were asked increasingly specific questions (see Stapel et al., 2002) probing their awareness of the priming stimuli, their awareness of the influence of the priming task on later judgments, and their general suspicion concerning the goal of the study. This procedure demonstrated that none of the participants were aware of the content of the priming stimuli.

Pretest. A pretest indicated that after conscious exposure to the emotion-eliciting primes, participants responded as expected on the word-completion, feelings, general-mood, and choice measures.

Results and Discussion

Tables 1 through 3 present results for the cognitive, feelings, and behavioral measures.[1] We conducted 3 (prime emotion: disgust, fear, no emotion) × 2 (prime exposure: quick, super-quick) analyses of variance on our cognitive and feelings measures and found the expected specific-emotion effects when the emotion-eliciting primes were flashed quickly, but not when they were flashed super-quickly. Specifically, the predicted interaction of prime emotion and prime exposure was found for completion of both disgust-related word fragments, $F(2, 84) = 5.51$, $p_{rep} = .96$, $\eta^2 = .12$, and fear-related word fragments, $F(2, 84) = 4.45$, $p_{rep} = .94$, $\eta^2 = .10$. This interaction was also found for subjective ratings of disgust, $F(2, 84) = 3.96$, $p_{rep} = .92$, $\eta^2 = .09$, and fearfulness, $F(2, 84) = 8.90$, $p_{rep} = 1.00$, $\eta^2 = .18$. Participants completed more word fragments as disgust-related words and reported feeling more disgusted after quick exposures

[1]For the sake of clarity, we provide statistical details of our most important results only. More detailed results are available upon request.

TABLE 1

Mean Number of Fragments Completed as Category-Related Words, as a Function of Prime and Exposure Duration: Study 1

Exposure duration and fragment type	Prime		
	Disgust	Fear	No emotion
Quick (120 ms)			
Disgust fragments	2.47_a (0.52)	1.20_b (0.94)	1.33_b (0.82)
Fear fragments	0.87_b (0.92)	1.80_a (0.86)	0.87_b (0.74)
Negative fragments	2.13_a (0.52)	2.53_a (0.64)	1.13_b (0.83)
Super-quick (40 ms)			
Disgust fragments	1.20_a (0.94)	1.13_a (0.64)	1.20_a (0.78)
Fear fragments	1.13_a (0.52)	1.00_a (0.93)	1.07_a (0.59)
Negative fragments	2.27_a (0.46)	2.20_a (0.56)	1.07_b (0.80)

Note. Standard deviations are given in parentheses. For each fragment type, the maximum score was 3. Within each row, means with different subscripts differ significantly ($p_{rep} > .88$).

to disgusting stimuli than after quick exposures to fearful or neutral stimuli (all p_{rep}s $> .88$). Furthermore, participants completed more word fragments as fear-related words and reported feeling more fearful after quick exposures to fearful stimuli than after quick exposures to disgusting or neutral stimuli (all p_{rep}s $> .88$). However, when exposures were super-quick, the emotion-specific word-completion measures and the emotion-specific subjective ratings revealed no specific-emotion effects (all Fs < 1).

Also as predicted, general mood effects appeared after both quick and super-quick exposures to disgusting and fearful stimuli: Participants completed more word fragments as general negative words and reported feeling more negative in the disgust and fear conditions than in the no-emotion condition, $F(2, 84) = 33.66$, $p_{rep} = 1.00$, $\eta^2 = .44$, and $F(2, 84) = 14.57$, $p_{rep} = 1.00$, $\eta^2 = .26$, for the word-completion and mood measures, respectively. As expected, in both exposure conditions, prime emotion had no effects on irrelevant specific-emotion scales (all Fs < 1).

TABLE 2

Mean Subjective Ratings as a Function of Prime and Exposure Duration: Study 1

Exposure duration and rating	Prime		
	Disgust	Fear	No emotion
Quick (120 ms)			
Mood rating	2.87_a (1.25)	3.07_a (1.22)	1.60_b (1.30)
Disgust rating	2.60_a (0.63)	1.66_b (0.62)	1.60_b (0.63)
Fear rating	1.87_b (0.74)	3.13_a (0.64)	2.13_b (0.92)
Super-quick (40 ms)			
Mood rating	3.00_a (0.85)	2.73_a (0.59)	1.73_b (0.80)
Disgust rating	1.93_a (0.70)	1.87_a (0.64)	1.60_a (0.51)
Fear rating	2.00_a (0.54)	1.87_a (0.64)	1.93_a (0.46)

Note. Standard deviations are given in parentheses. Mood ratings were made on a scale from 1 to 7; higher means indicate more negative mood. Disgust and fear ratings were made on a scale from 1 to 5; higher means indicate more feelings of disgust or fear. Within each row, means with different subscripts differ significantly ($p_{rep} > .88$).

TABLE 3

Proportion of Participants Choosing the Scary-Movie Test as a Function of Prime and Exposure Duration: Study 1

Exposure duration	Prime		
	Disgust	Fear	No emotion
Quick	$.73_a$ (.46)	$.33_b$ (.49)	$.53_{ab}$ (.52)
Super-quick	$.47_a$ (.52)	$.40_a$ (.51)	$.53_a$ (.52)

Note. Standard deviations are given in parentheses. Within each row, means with different subscripts differ significantly from each other ($p_{rep} > .88$).

To test our hypothesis with the choice measure, we performed Kruskal-Wallis nonparametric tests for the quick and the super-quick exposure conditions separately. These analyses showed that participants chose to continue with the scary-movie test more frequently when disgusting stimuli were flashed quickly than when fearful stimuli were flashed quickly, $\chi^2(1, N = 90) = 4.66$, $p_{rep} = .91$. When stimuli were flashed super-quickly, the choice measure showed no significant difference among the prime-emotion conditions ($\chi^2 < 1$).

The results show that emotional experience and behavior can be elicited in a person who is not consciously aware of their cause. However, the measures were completed in a fixed order, and one could argue that responses on the cognitive measure might have influenced responses on the feelings and behavioral measures. We deem this alternative explanation unlikely for two reasons: First, Innes-Ker and Niedenthal (2002) have shown that semantic activation of emotion knowledge is not enough to elicit the subjective feelings associated with a full-blown emotion. Second, we think that semantic activation of the emotions should have led to the opposite pattern of results for our behavioral measure. Semantic activation of fear should have led participants in the fear condition to choose the scary-movie test more often than the strange-food test. However, as expected, our findings showed the opposite pattern: Quick exposure to fear-eliciting stimuli caused participants to choose the strange-food test more often than the scary-movie test. Nevertheless, we resolved the order confound in Study 2.

STUDY 2

Method

Undergraduates ($N = 90$) participated in Study 2 for course credit. The design and priming procedure were identical to those of Study 1. Our dependent measures were similar to those of Study 1 except that we used an alternative cognitive measure and counterbalanced the order of this measure and the feelings measures. Also, participants indicated their general mood on a 9-point scale ranging from *negative* (1) to *positive* (9), instead of on a 7-point scale, as in Study 1.

The alternative cognitive measure consisted of six emotion-specific scenarios, three fear scenarios and three disgust scenarios. For example, in one of the fear scenarios, participants imagined walking on the street at night and noticing that a suspicious person was moving toward them. They then indicated the likelihood that they would cross the street. We expected that scared participants would be more likely than participants who did not feel scared to interpret the situation as fearful and therefore to indicate that they would cross the street. In one of the disgust scenarios, participants indicated the extent to which they would be willing to shake the hand of someone who just blew his or her nose. We expected that disgusted participants would be more likely than other participants to interpret the situation as disgusting and therefore to be less likely to indicate that they would shake this person's hand. Participants read the scenarios in a mixed order. In each case, participants indicated the likelihood that they would perform the suggested action, using a 9-point scale from *very unlikely* (1) to *highly likely* (9). For the analyses, the scores on each scenario were recoded such that a high score represented a high likelihood to interpret the scenario in terms of the intended emotion.

Results

Tables 4 through 6 present results for the cognitive, feelings, and behavioral measures. We conducted 3 (prime emotion: disgust, fear, no emotion) × 2 (prime exposure: quick, super-quick) analyses of variance on our cognitive and feelings measures and found the predicted specific-emotion effects when the emotion-eliciting primes were flashed quickly, but not when they were flashed super-quickly. Specifically, the predicted interaction of prime emotion and prime exposure was obtained for our disgust scenarios, $F(2, 84) = 4.91$, $p_{rep} = .95$, $\eta^2 = .11$, and for our fear scenarios, $F(2, 84) = 5.21$, $p_{rep} = .96$, $\eta^2 = .11$. The emotion-specific subjective ratings also showed this pattern, $F(2, 84) = 4.02$, $p_{rep} = .92$, $\eta^2 = .09$, and $F(2, 84) = 15.27$, $p_{rep} = 1.00$, $\eta^2 = .27$, for disgust and fear, respectively. Participants were more likely to interpret the disgust scenarios in terms of disgust and reported feeling more disgusted after quick exposures to disgusting stimuli than after quick exposures to fearful or neutral stimuli (all p_{rep}s $> .88$). Furthermore, participants were more likely to interpret the fear scenarios in terms of fear and reported feeling more fearful after quick exposures to fearful stimuli than after quick exposures to disgusting or neutral stimuli (all p_{rep}s $> .88$). However, when exposures were super-quick, the scenario measures and the emotion-specific subjective ratings revealed no specific-emotion effects (all Fs < 1).

As predicted, general mood effects appeared after both quick and super-quick exposures to disgusting and fearful stimuli: Participants interpreted the scenarios slightly more negatively and reported feeling more negative in the disgust and fear conditions than in the no-emotion condition, $F(2, 84) = 11.10$, $p_{rep} = 1.00$, $\eta^2 = .21$. As expected, in both exposure conditions, the irrelevant emotion-specific scales showed no significant effects (all Fs < 1).

To test our hypothesis with the choice measure, we performed Kruskal-Wallis nonparametric tests for the quick and the super-quick exposure conditions separately. These analyses showed that participants chose to continue with the scary-movie test more frequently when disgusting stimuli were flashed quickly than when fearful stimuli were flashed quickly, $\chi^2(1, N = 90) = 4.83$, $p_{rep} = .91$. When stimuli were flashed super-quickly, there was no significant difference among the prime-emotion conditions ($\chi^2 < 1$).

TABLE 4
Mean Likelihood of Interpreting the Scenarios in Terms of the Intended Emotion, as a Function of Prime and Exposure Duration: Study 2

Exposure duration and scenario type	Prime		
	Disgust	Fear	No emotion
Quick (120 ms)			
Disgust scenarios	5.89_a (1.07)	4.58_b (0.72)	3.16_c (0.80)
Fear scenarios	4.38_b (1.10)	5.84_a (0.63)	3.31_c (0.85)
Super-quick (40 ms)			
Disgust scenarios	4.53_a (1.37)	4.67_a (1.05)	3.09_b (0.71)
Fear scenarios	4.37_a (1.43)	4.33_a (0.83)	3.11_b (0.89)

Note. Standard deviations are given in parentheses. Ratings were made on a scale from 1 to 9; higher means indicate greater likelihood of interpreting the scenarios in terms of the intended emotion. Within each row, means with different subscripts differ significantly from each other ($p_{rep} > .88$).

TABLE 5
Mean Subjective Ratings as a Function of Prime and Exposure Duration: Study 2

Exposure duration and rating	Prime		
	Disgust	Fear	No emotion
Quick (120 ms)			
Mood rating	6.27_a (1.22)	6.07_a (1.22)	4.93_b (1.62)
Disgust rating	2.67_a (0.72)	1.73_b (0.59)	1.60_b (0.63)
Fear rating	1.93_b (0.88)	3.60_a (0.51)	2.13_b (0.92)
Super-quick (40 ms)			
Mood rating	6.00_a (0.93)	6.00_a (0.66)	4.87_b (0.83)
Disgust rating	1.93_a (0.70)	1.87_a (0.64)	1.60_a (0.51)
Fear rating	2.00_a (0.54)	1.87_a (0.64)	1.93_a (0.46)

Note. Standard deviations are given in parentheses. Mood ratings were made on a scale from 1 to 9; higher means indicate more negative mood. Disgust and fear ratings were made on a scale from 1 to 5; higher means indicate more feelings of disgust or fear. Within each row, means with different subscripts differ significantly from each other ($p_{rep} > .88$).

TABLE 6
Proportion of Participants Choosing the Scary-Movie Test as a Function of Prime and Exposure Duration: Study 2

Exposure duration	Prime		
	Disgust	Fear	No emotion
Quick (120 ms)	$.60_a$ (.51)	$.20_b$ (.41)	$.47_{ab}$ (.52)
Super-quick (40 ms)	$.53_a$ (.52)	$.47_a$ (.52)	$.47_a$ (.52)

Note. Standard deviations are given in parentheses. Within each row, means with different subscripts differ significantly from each other ($p_{rep} > .88$).

GENERAL DISCUSSION

The results of two studies strongly support the hypothesis that specific emotions can be elicited without conscious awareness of their cause. Quick, unconscious exposures to emotion-eliciting pictures resulted in emotion-specific effects on cognitive, feelings, and behavioral measures. Specifically, disgusting pictures increased cognitive accessibility of disgust words and feelings of disgust. Similarly, fearful pictures increased cognitive accessibility of fear words and feelings of fear. Notably, our choice measure showed the pattern opposite to what would be expected on the basis of cognitive accessibility: Quick exposure to fear-eliciting stimuli caused participants to choose to test potentially disgusting food, whereas quick exposure to disgust-eliciting stimuli caused participants to choose to watch scary movies. When exposure to the priming stimuli was super-quick, global mood, rather than a specific emotion, was evoked. These findings are the first to empirically demonstrate (a) that specific emotions can be evoked without conscious awareness of their cause, (b) that unconscious exposure to emotion-eliciting pictures can evoke the specific corresponding emotion and does not evoke other emotions of similar valence, and (c) that unconscious emotion induction develops from elicitation of global affect to elicitation of specific emotions.

How do our findings relate to the current debate on unconscious emotions? Although most researchers deny the existence of unconscious emotions (Barrett, 2005; Clore, 1994), other researchers see unconscious emotions as likely (Winkielman & Berridge, 2004). Emotions might be viewed as unconscious when they are detected by indirect behavioral or physiological measures, without being accompanied by conscious emotional experience. However, what does it mean when only indirect measures suggest the presence of an emotion? We think that the range of emotional measures that are affected depends on an emotion's intensity. When emotions are full-blown, people become aware of their emotions by perceiving their own actions and bodily reactions. When emotions are weak, people fail to notice their weakly related actions and bodily reactions. The current research was not designed to investigate this issue. Rather, this research shows that the cause of emotional experience and behavior can be unconscious. Thus, emotions can lead secret lives in the sense that emotions can be elicited unconsciously.

In this research, we induced the specific emotions of fear and disgust. We selected these emotions because they are of the same valence but differ with respect to the specific cognitions, feelings, and behaviors that they elicit. This design allowed us to emphasize our main point: that specific emotions can be elicited unconsciously. One could argue that we should have included specific positive emotions to make our case. Indeed, positive emotions are functional and important for survival. However, positive emotions, such as joy and happiness, are less specific and inherently more valence based than negative emotions (Fredrickson, 2001), and would have given us insufficient opportunity to test our emotion-specificity model. Therefore, no positive emotions were included in the present studies.

Our findings clearly illustrate how an affective response may unfold unconsciously over time, developing from a global, valence-based mood to a specific, meaning-based emotion. On a general level, our findings explain how it is possible that people sometimes experience a specific emotion without immediately knowing why.

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